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HOW HEAVILY SHOULD WESTERN WHITE PINE BE PRUNED?

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Three tests were initiated in the fall of 1940 to determine the height to which western white pine trees can be pruned without seriously retarding growth.

The tests are located on the Kaniksu, Coeur d'Alene, and St. Joe National Forests, all in northern Idaho, in moderately open to very open stands, selected because these are the stands least capable of producing high-quality wood without artificial pruning. In numbers of trees over 0.5 inches d.b.h. per acre the stand densities are approximately 1000, 270, and 200 on the Coeur d'Alene, Kaniksu, and St. Joe tests, respectively. The trees are unevenly distributed on the three areas. The most even distribution is on the Coeur d'Alene and the most uneven on the St. Joe test.

The trees, at the time of pruning, were from 20 to 30 years in age. Diameters at breast height ranged from 3 to 10 inches and total heights from 20 to 45 feet. All of the tests are located on sites of good to excellent quality. The Coeur d'Alene and St. Joe tests are situated on gentle south-facing slopes and the Kaniksu test is on a flat.

Paired trees, alike with respect to d.b.h., height, and crown characteristics were selected. One tree from each pair was pruned with a pruning saw and the other left unpruned as a check. Pruning ranged in severity from 17 percent to 69 percent of the live-crown length. In all, 112 trees were included in the experiment.

Measurements of total tree-height, live-crown length, height pruned, and d.b.h. were taken at the time the tests were started. Subsequently, height and d.b.h. growth have been measured annually for five years.

Results

1. Mortality

The most striking response to pruning occurred among the heavily pruned trees. During the first three years following pruning, eight trees died

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among the 17 from which more than 55 percent of the live crown was removed. None of the less heavily pruned trees died. It appears that about 50 percent is the safe limit from the standpoint of causing serious mortality.

2. Height and diameter growth

The removal of one-fifth of the live-crown length caused no appreciable reduction in rate of height growth (Figure 1). Pruning away one-third of the live crown resulted in an average loss in annual growth of only 0.1 foot. However, greater live-crown removal resulted in seriously decreased height growth, a reduction of 36 percent resulting from pruning away three-fifths of the live-crown length. Due to the mortality among heavily pruned trees, the growth data given for higher intensities of pruning do not tell the whole story. Only the trees of exceptional vigor survived heavy pruning.

There appeared to be a slight stimulation in height growth amounting to 4 percent of unpruned tree growth during the first year following the removal of one-fifth of the live crown (Figure 2). The stimulation was lost in the second and third years, and after the third year there was a slight decline in growth rate. However, the average differences in growth between one-fifth pruned and unpruned trees are so small as to be of no practical consequence. The safest conclusion is that removing one-fifth of the crown had little effect on height growth.

The rates of height growth of trees pruned two-fifths definitely declined. The greatest reductions occurred during the first two years. There was some recovery by the end of 5 years. The losses in height growth from three-fifths pruning were even more pronounced.

Diameter growth fell off more rapidly than height growth as a result of pruning (Figure 3). Removal of one-fifth of the crown caused an average reduction in diameter growth of 5 percent during the 5-year period as compared with no appreciable loss in height growth. Pruning away three-fifths of the crown caused a 73-percent drop in growth among the trees that survived this severe treatment in contrast to a decline in height growth of 36 percent.

The diameter growth rates of trees pruned one-fifth appeared to have recovered fully before the end of the 5-year period (Figure 4). The more heavily pruned trees have recovered somewhat but after 5 years they are still lagging behind the unpruned trees.

The evidence from these experiments indicates that only about one-third of the live crown can be removed without substantially lowering the rates of growth, both in diameter and in height.

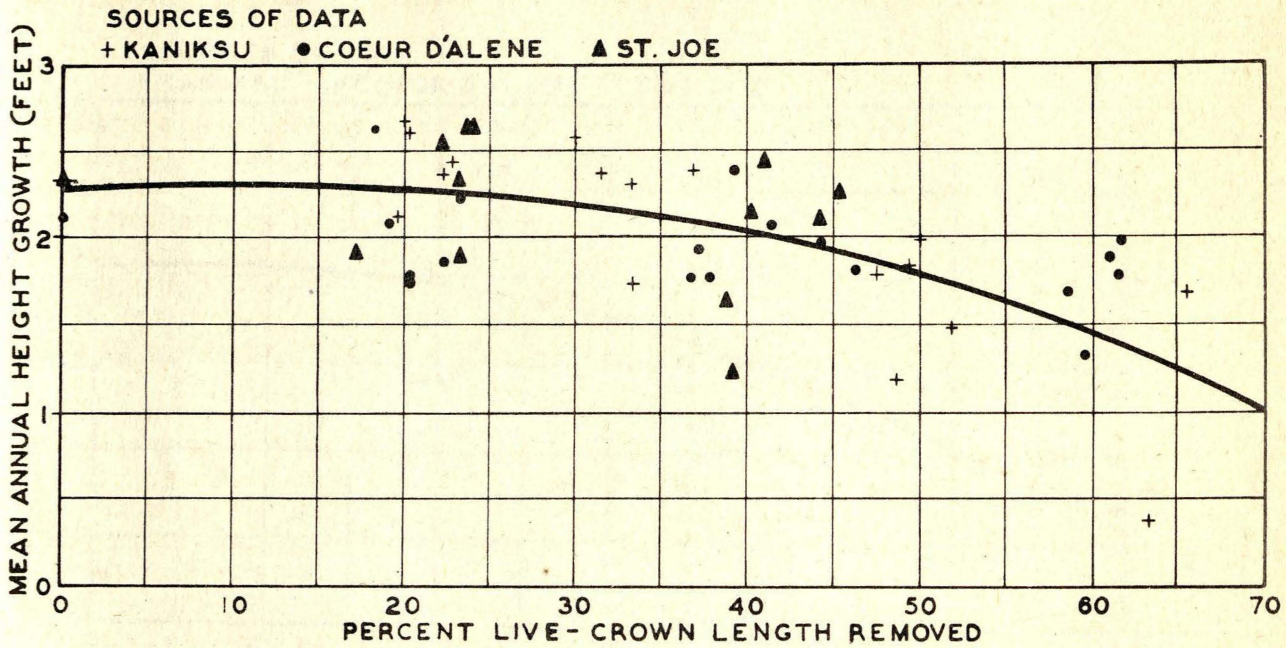

FIG. 1. EFFECT OF PRUNING ON HEIGHT GROWTH OF WHITE PINE DURING FIVE-YEAR PERIOD

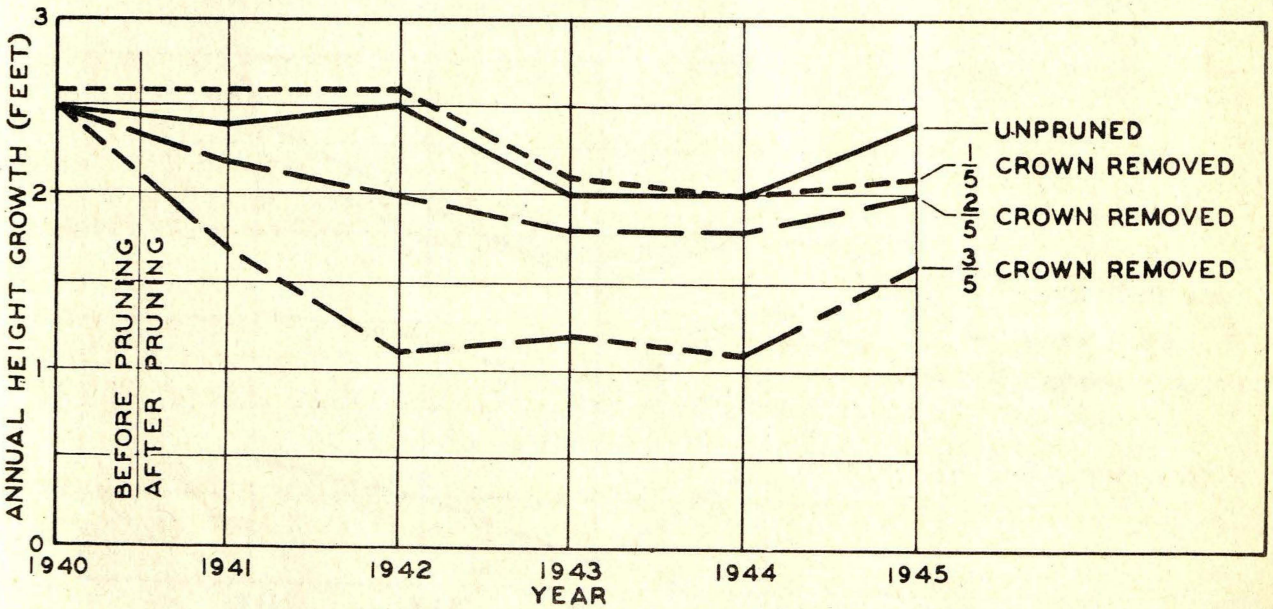

FIG. 2. ANNUAL HEIGHT GROWTH OF PRUNED AND UNPRUNED WHITE PINE

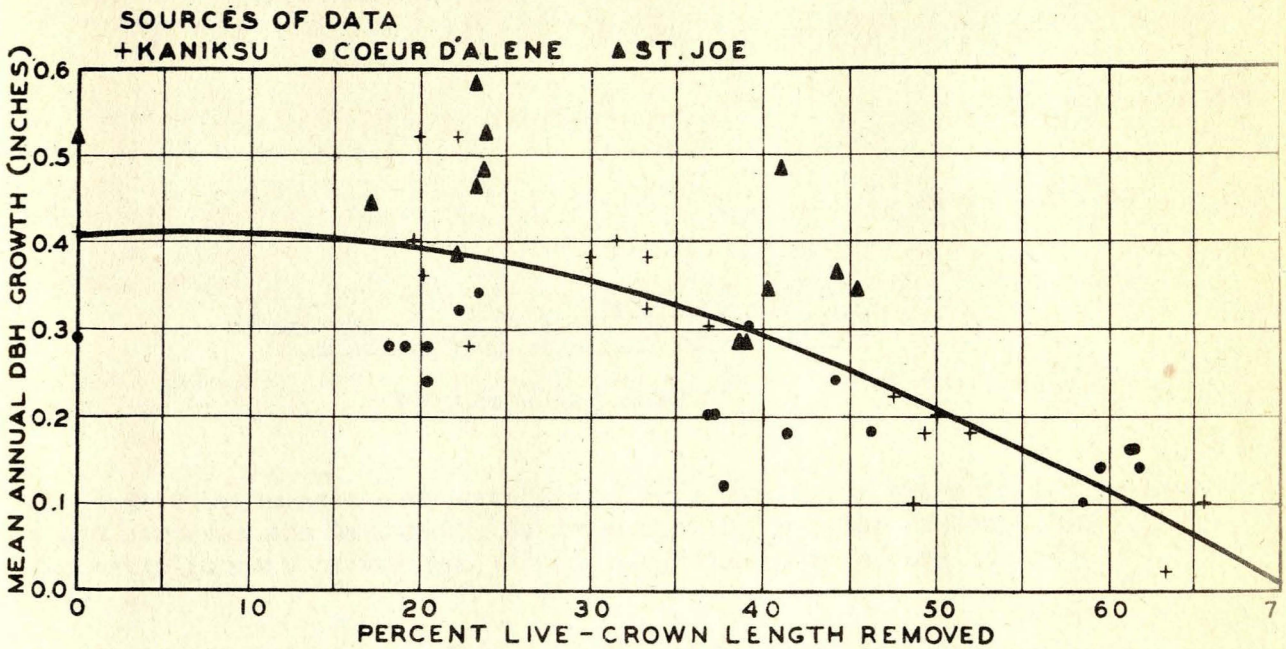

FIG. 3. EFFECT OF PRUNING ON DIAMETER GROWTH OF WHITE PINE DURING FIVE-YEAR PERIOD

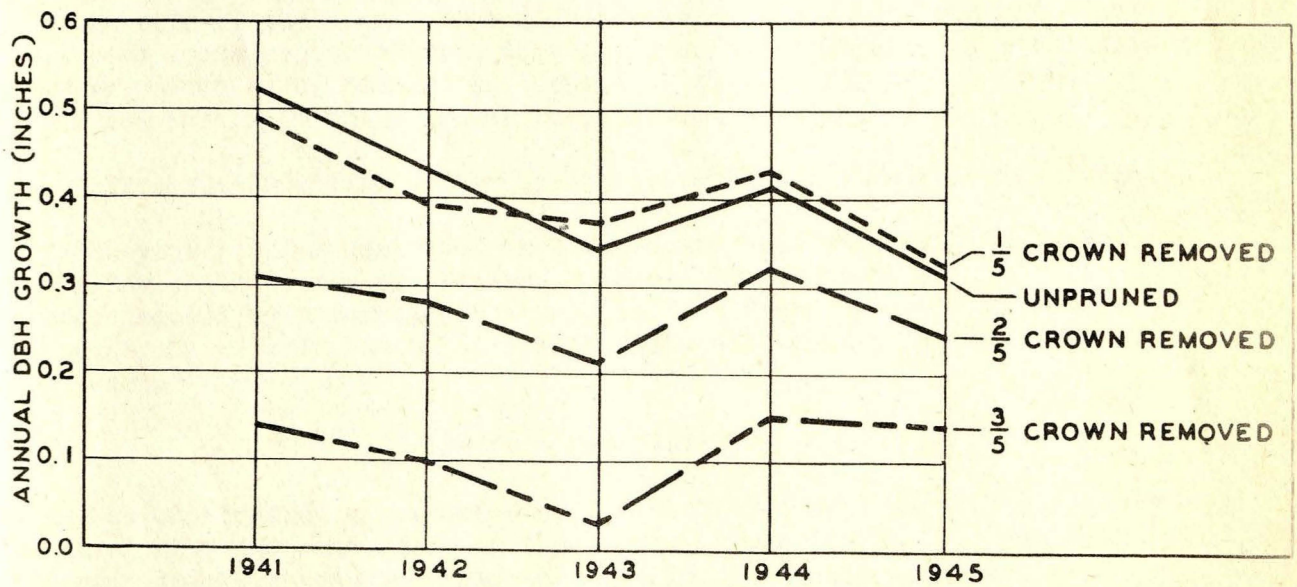

FIG. 4. ANNUAL DIAMETER GROWTH OF PRUNED AND UNPRUNED WHITE PINE